

ARM Updates

ARM-ASR Joint User Facility & PI Meeting

March 20, 2018

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U.S. DEPARTMENT OF
ENERGY

Office
of Science

Office of Biological
and Environmental Research

Recognition



- Doug Sisterson is retiring from ANL this spring after over 40 years at ANL and 28 years with ARM
- DOE recognizes and thanks Doug for his exceptional contributions to ARM throughout his career

ARM Triennial Review

- DOE BER reviews projects & facilities every 3 years
- ARM underwent its latest Triennial Review in April, 2017
 - Review panel charged to evaluate science, operations, and management
 - Overall, reviewers were positive & found that ARM:
 - Has unique capabilities & enables high impact science supporting CESD strategic goals
 - Has effective management and operation
 - Effectively engages with the BER user community
 - Has addressed the recommendations from the 2014 review
 - Reviewers recommended actions around:
 - Communications and metrics
 - Broadening ARM user base
 - Data products, particularly VAPs from AMF campaigns, & data discovery
 - Regular reviews of instrumentation, data, and activities; update radar plan & develop aerosol plan
 - Developing future plans for LASSO

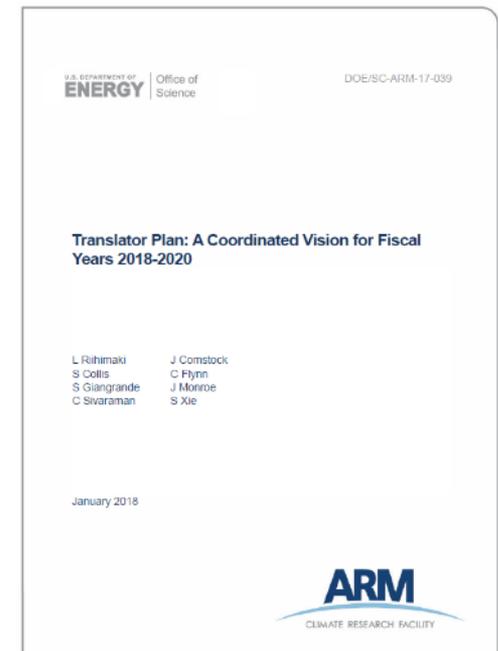
G-1 Aircraft status

- G-1 recently completed ACE-ENA campaign and is scheduled for CACTI campaign in Nov/Dec 2018
- G-1 aircraft was built in 1961 – increasing maintenance issues, difficulty in finding parts
- G-1 aircraft will be retired after CACTI campaign
- DOE starting the formal project management process for a replacement aircraft
 - Critical Decision 0 (CD-0) – statement of mission need approved 2017
 - Alternatives analysis determined used aircraft was best option
 - CD-1 (Approve Alternative Selection and Cost Range) approved March 2018
 - Administration’s FY19 budget request includes funds for replacement aircraft
 - If funding is received in FY19, expect aircraft ready for research campaigns in 2022-2023



New data products

- ARM is continuously developing new data products, processing additional dates/sites for existing products, improving data discovery & data delivery
- Translators recently released 3-year plan
- Check ARM newsletter for 'Data Announcements'
- Provide input on data product priorities through Working Groups and Breakout Session reports
- ARM Data Booth – in Lobby
 - Questions about how to get ARM data? Questions about ARM computing? Suggestions for Data Discovery?
 - Stop by during coffee breaks or break-out session times



NEWS & EVENTS - DATA ANNOUNCEMENTS

CONTINUOUS LARGE-SCALE FORCING DATA NOW AVAILABLE FOR CLOUD MODELING FROM SOUTHERN GREAT PLAINS

Published: 10 January 2018

Data for the years 2004 to 2015 are now available for version 2 of the [continuous large-scale forcing value-added product \(VAP\)](#), known as VARANAL, from the [Southern Great Plains \(SGP\) atmospheric observatory](#). This product includes both the large-scale forcing terms and the evaluation fields, which can be used for driving single-column models, cloud-resolving models, or larger-eddy simulations (LES), including [LASSO—the LES-ARM Symbiotic Simulation and Observation workflow](#), and validating model simulations.

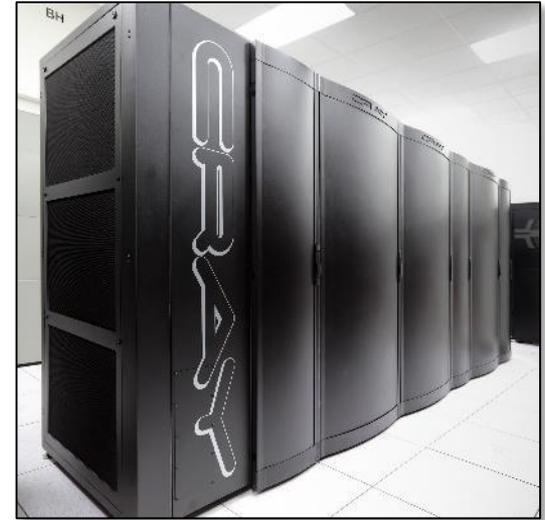
The updated VARANAL VAP incorporates [Eddy Correlation Flux Measurement System \(ECOS\)](#) data into the analysis to better represent various surface types within the analysis domain. Surface latent and sensible fluxes are a merged product from [Energy Balance Bowen Ratio \(EBR\)](#) and ECOS measurements. Turbulent fluxes are from the [Quality-Controlled ECOS \(QC-ECOS\)](#) and [Bulk Aerodynamic Technique \(BAT\)/SALMON](#) VAPs.

Background data are also updated from [Rapid Update Cycle \(RUC\)](#) (before May 2012) to the [Rapid Refresh \(RAP\)](#) (after May 2012) analysis. In addition, top-of-atmosphere radiative fluxes are now used, with improved algorithm and bug fixes, due to the recent reprocessing of the satellite data.

The seasonal cycle of southern Great Plains domain-averaged latent heat (LH) and sensible heat (SH) fluxes is shown by using QC-ECOS-only (QC-ECOS), SALMON-only (BAT/RBR), and both QC-ECOS and SALMON data (merged) averaged from 2004-2015, and the impact to the derived large-scale vertical velocity (w_{vert}). Version 2 of the continuous forcing value-added product uses the merged surface fluxes.

ARM computing resources

- In FY17, ARM added two high performance computing clusters for LASSO model operations and large-scale ARM data processing & visualization
- Science users can propose to use the ARM high performance computing for activities that:
 - Involve multiple terabytes of ARM data, which would be prohibitive to download to other computer systems
 - Require parallel processing of computationally intensive code applied to ARM data sets
 - Directly use the LASSO simulations
- Requests are reviewed quarterly
- <https://www.arm.gov/capabilities/computing-resources/hpc-request>



CAPABILITIES > COMPUTING RESOURCES
REQUEST ACCESS TO THE ARM CLUSTER

REQUESTER
Who is making this request?
• Enter your last name and click search
• Select your name from the list that appears

PROJECT DESCRIPTION
Briefly describe the proposed research to be done using the ARM computational resources—including specific scientific objectives. Briefly describe the relevance to the ARM Facility and justify the need for ARM high-performance computing (HPC) resources to meet the research objectives. Note that any request for ARM computational resources must include a clear use of ARM observational data and may include use of ARM modeling (e.g., LASSO) data.

COMPUTATIONAL APPROACH
Provide a description of your proposed computational approach. The description may mention:
1. Specific libraries required by the simulation and analysis software, algorithms and numerical techniques employed, programming languages, and other software used.

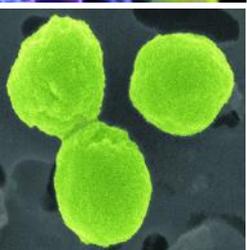
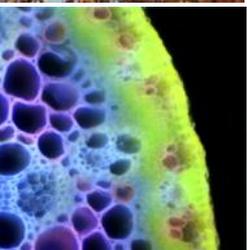
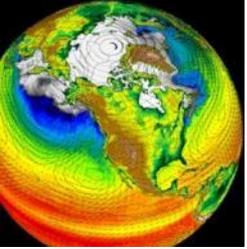
ARM science computing projects

- Calculation of cloud size distributions from LASSO data
 - PI: Thijs Heus
- Study spatial variability of the scanning radar observations at Oliktok
 - PI: Maximilian Maahn
- AERI Optimal Estimation Retrieval
 - PI: Dave Turner
- LASSO Data from SGP
 - PI: Jeremy McGibbon

ARM Mobile Facility Workshop

- DOE is planning a workshop to get input from the scientific community on the highest priority scientific objectives, research challenges, and opportunities for the ARM Mobile Facility capabilities.
- Late summer 2018
- Co-chairs:
 - Rob Wood, University of Washington
 - Guang Zhang, Scripps/UCSD
 - Nicki Hickmon, Argonne





Field Campaigns

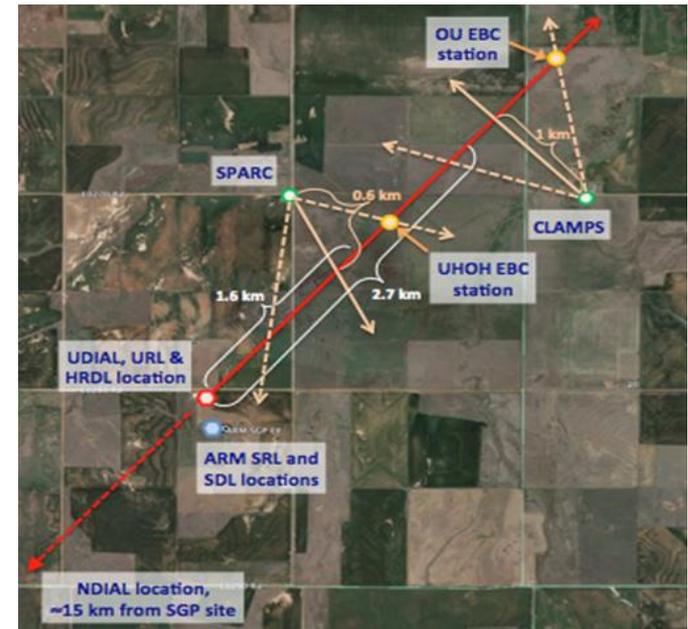
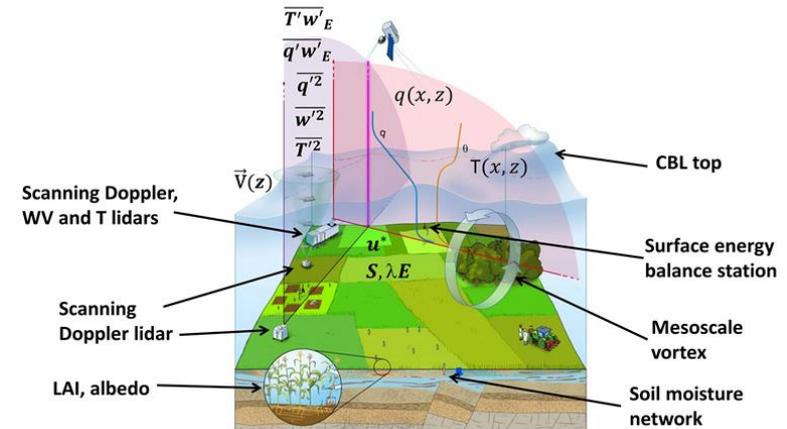
Campaign Proposal Process

- Small Campaigns
 - Pre-proposals accepted year-round
 - Reviewed & approved quarterly
 - Level of campaign determines need for proposal, type of review, decision timeline and start time after decision
 - Plan ahead for small campaigns!
 - Data submission & final report within 6 months of campaign end
- AMF/AAF Campaigns
 - Requests for AMFs and AAF competed through annual call
 - Annual call typically issued in Dec
 - Pre-applications in Feb
 - Full applications in May
 - Science Board review in late summer/fall
 - <https://www.arm.gov/research/campaign-proposal>

Recently Completed Campaigns (1)

- **Land-Atmosphere Feedback Experiment (LAFE)**

- PI Volker Wulfmeyer, U. Hohenheim
- August 2017 at SGP
- Deployment of multiple state-of-the-art scanning lidar systems to study land-atmosphere feedback processes
- **Plenary presentation Thursday morning**
- Publication & research highlight on eclipse observations:
 - Turner D, V Wulfmeyer, A Behrendt, T Bonin, A Choukulkar, R Newsom, W Brewer, and D Cook. 2018. ["Response of the Land-Atmosphere System Over North-Central Oklahoma During the 2017 Eclipse."](#) *Geophysical Research Letters*, 45(3), 10.1002/2017GL076908.



Recently completed campaigns (2)

- LASIC – Layered Atlantic Smoke Interactions with Clouds

- PI Paquita Zuidema, U. Miami
- AMF1 at Ascension Island
 - June 2016 – Oct 2017

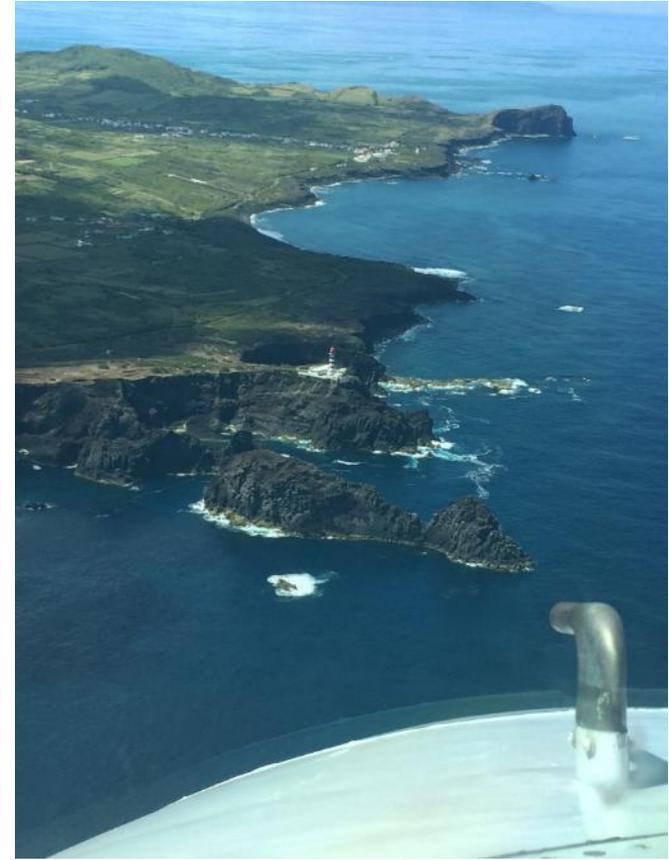


- **Poster talk by Allison Aiken Tuesday morning**
- **Plenary talk by Paquita Zuidema Thursday morning**
- **Absorbing aerosols & interactions with clouds – breakout session Thursday morning**



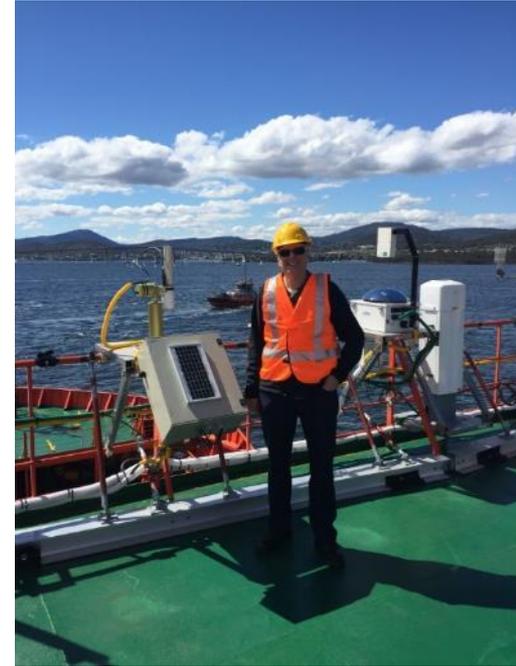
Recently completed campaigns (3)

- **ACE-ENA (Aerosol and Cloud Experiments in the Eastern North Atlantic)**
 - PI Jian Wang, BNL
 - G-1 campaigns around ENA in June-July 2017 and Jan-Feb 2018
 - Comprehensive in-situ characterizations of boundary layer structure, and associated vertical distributions and horizontal variabilities of low clouds and aerosol over the Azores
 - **Breakout session Monday afternoon**



Current campaigns (1)

- **MARCUS (Measurement of Aerosols, Radiation and CloUds over the Southern Oceans)**
 - PI Greg McFarquhar, U. Illinois
 - AMF2 deployed on *Aurora Australis* as it conducts multiple supply transits between Tasmania and Antarctica; Sep 2017 – Apr 2018
 - Goal: improve understanding of clouds, aerosols, air-sea exchanges and their interactions over the Southern Ocean
 - Campaign currently on it's last voyage; returning to Hobart ~ March 23
 - **Breakout session Thurs morning**



Aurora Australis; Australian Antarctic Division



Current campaigns(2)

- CLOUDMAP - Collaboration Leading Operational Unmanned Aerial Systems (UAS) Development for Meteorology and Atmospheric Physics
- PI: Jamey Jacob, Oklahoma State
- NSF-funded collaboration to develop capabilities that will allow meteorologists and atmospheric scientists to use unmanned aircraft as a common, useful everyday tool.
- Project includes UAS boundary layer characterization & validation flights at SGP during 2017-2019
- RIVAL - Radiosonde Intercomparison & VALidation
- PI: Lori Borg, U. Wisconsin
- Sustained intercomparison and validation campaign to fully quantify the differences between RS92 & RS41 radiosonde sensors
- Twin launches of RS92 & RS41 sondes at SGP, ENA, NSA
- Collaboration with GRUAN (GCOS Reference Upper Air Network)
- Coordination with ARM radiosonde launches supported by NOAA for SNPP-JPSS validation

Upcoming campaigns (1)

- CACTI (Cloud, Aerosol, and Complex Terrain Interactions)
 - PI Adam Varble, U. Utah
 - AMF1 will be deployed to north-central Argentina; Oct 2018 – April 2019
 - G-1 deployed Nov-Dec, 2018
 - Goal: improve understanding of cloud lifecycle and organization in relation to environmental conditions in order to improve cumulus, microphysics, and aerosol parameterizations
 - **Breakout session Thursday morning**
- MOSAiC Atmosphere
 - PI Matt Shupe, U. Colorado/NOAA
 - AMF2 to deploy on *Polarstern* icebreaker, which will be frozen into and drift with Central Arctic sea-ice for 1 year; Sep 2019 – Oct 2020
 - Target atmosphere and atmosphere-surface interactions that are critically under-observed in the Arctic and are leading contributors to model uncertainties in the region
 - **Breakout Session yesterday**



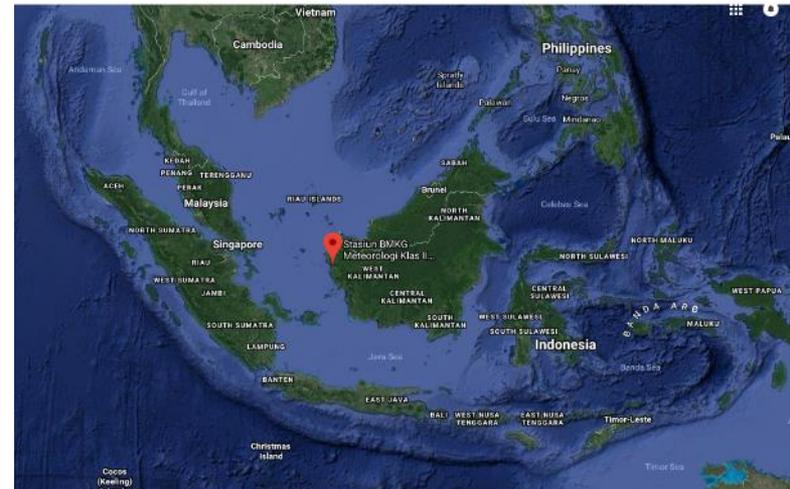
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<https://commons.wikimedia.org/w/index.php?curid=13656074>



Polarstern
Alfred Wegner Institute

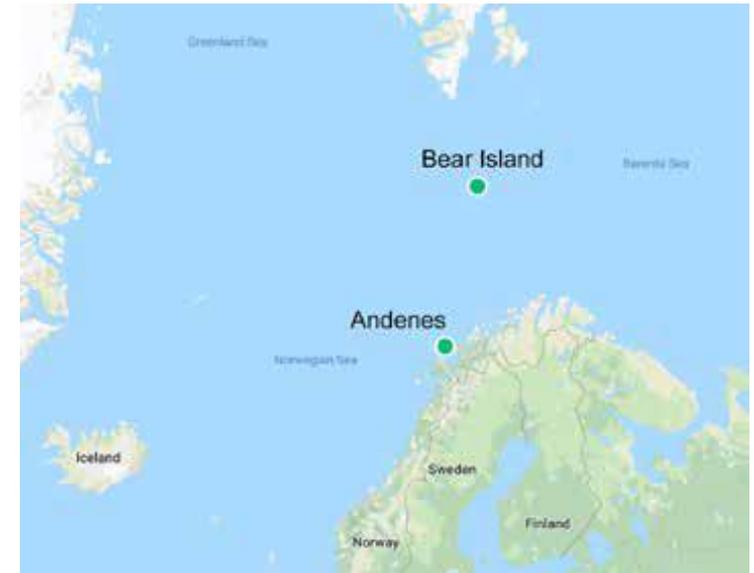
Upcoming campaigns (2)

- POPEYE – Profiles at Olightok Point to Enhance YOPP Experiments
- PI: Gijs de Boer, U. Colorado
- ARM tethered balloon & UAS flights + enhanced radiosondes
- Summer, 2018
- measurements of atmospheric thermodynamic structure, cloud and precipitation properties, and aerosol properties
- ARM contribution to international Year of Polar Prediction (YOPP)
- DIMOP - Diurnal Cycle Interactions with Madden-Julian Oscillation Propagation
- PI: Samson Hagos, PNNL
- Small set of instrumentation (radiometers, eddy flux, rain gauge, ceilometer) at Pontiak, Borneo
- Sep 2018 – Aug 2019
- Studying “barrier effect” of the maritime continent on MJO propagation
- ARM contribution to international Years of the Maritime Continent (YMC)



Upcoming campaigns (3)

- COMBLE (Cold-air Outbreaks in the Marine Boundary Layer Experiment)
 - PI Bart Geerts, U. Wyoming
 - AMF1 planned to deploy to Andenes, Norway; supplemental measurements on Bear Island in the N. Atlantic
 - January to May 2020
 - Goal: quantify the properties of boundary layer convection and air-mass transformations in cold-air outbreaks over open water in the Arctic
 - **Breakout session Wed morning**



(MODIS image; source: <https://earthobservatory.nasa.gov/>)

